List of Revised Courses

Department : *Electronics and Communication Engineering*

Program Name : *B.Tech.*

Academic Year : 2020-21

List of Revised Courses

Sr. No.	Course Code	Name of the Course
01.	EC05TPC08	Electromagnetic Waves
02.	EC05TPC09	Computer Network
03.	EC05TPC11	Control Systems
04.	EC05TPE04	Computer Architecture
05	EC05TPE01	Information Theory & Coding
06	EC05TOE01	Data Structure & Algorithms
07	EC06TPC12	Digital Signal Processing
08	EC06TPC13	Probability Theory and Stochastic Processes
09	EC06TPE05	Antenna & Wave Propagation
10	EC06TPE06	Power Electronics
11	EC201TES01/ EC202TES04	Basic Electrical and Electronics Engineering

विभागाध्यक्ष (इले. एवं संचार अभियांत्रिकी)
H.O.D. (Elect. & Comm. Engineering)
प्रौद्योगिकी संस्थान
Institute of Technology
गु. घा. वि., बिलासपुर (छ.ग.)
G. G. V. Bilaspur (C.G.)

Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year: 2020-21

School : *School of Studies of Engineering and Technology*

Department : *Electronics and Communication Engineering*

Date and Time : *July 14, 2020 – 11:00 AM*

Venue : *Online Platform*

The scheduled meeting of member of Board of Studies (BoS) of Department of Electronics and Communication Engineering, School of Studies of Engineering and Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur was held to design and discuss the B. Tech. Third year (V and VI semesters) scheme and syllabi.

The following members were present in the meeting:

1. Prof. Shrish Verma (External Expert Member BoS, Dept. of ECE, NIT Raipur)
2. Mr. Vikas Patel, (External Expert Member BoS, Senior SDE, BSNL Bilaspur)
3. Mrs. Anita Khanna (HOD, Assistant Prof., Dept. of ECE-cum Chairman, BOS)
4. Mr. Shrawan K. Patel (Member BoS, Assistant Professor, Dept. of ECE)
5. Mrs. Bhawna Shukla (Invited Member, Assistant Professor, Dept. of ECE)
6. Mrs. Beaulah Nath (Invited Member, Assistant Professor, Dept. of ECE)
7. Mr. Nipun Kumar Mishra(Invited Member, Assistant Professor, Dept. of ECE)
8. Dr. Soma Das (Invited Member, Assistant Professor, Dept. of ECE)
9. Mr. Sumit Kumar Gupta (Invited Member, Assistant Professor, Dept. of ECE)
10. Mrs. Praveena Rajput (Invited Member, Assistant Professor, Dept. of ECE)
11. Mrs. Nikita Kashyap (Invited Member, Assistant Professor, Dept. of ECE)
12. Dr. Anil Kumar Soni (Invited Member, Assistant Professor, Dept. of ECE)
13. Mr. Chandan Tamrakar (Invited Member, Assistant Professor, Dept. of ECE)

Following points were discussed during the meeting

1. New CBCS based evaluation scheme of B. Tech. Third year (V and VI semesters) was discussed and finalized.
2. Courses of B. Tech. Third year (V and VI semesters) are discussed one by one and the changes have been incorporated as per the valuable suggestions of Expert member.

The committee discussed and approved the scheme and syllabi. The following courses were revised in the of B. Tech. Third year (V and VI semesters):

- Electromagnetic Waves (EC05TPC08)
- Computer Network (EC05TPC09)
- Control Systems (EC05TPC11)
- Computer Architecture (EC05TPE04)
- Information Theory & Coding (EC05TPE01)
- Data Structure & Algorithms (EC05TOE01)
- Digital Signal Processing (EC06TPC12)
- Probability Theory and Stochastic Processes (EC06TPC13)
- Antenna & Wave Propagation (EC06TPE05)
- Power Electronics (EC06TPE06)

The following new courses were introduced in the of B. Tech. Third year (V and VI semesters):

- EC05TPE02 CMOS Design
- EC05TPE03 Introduction to MEMS
- EC06TPE07 High Speed Devices & Circuits
- EC06TPE08 Nanoelectronics
- EC06TOE04 Artificial Intelligence

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G. G. V. Bilaspur (C.G.)

Signature & Seal of HoD

Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year: 2020-21

School : *School of Studies of Engineering and Technology*

Department : *Electronics and Communication Engineering*

Date and Time : *December 25, 2020 – 11:00 AM*

Venue : *Online Platform*

The scheduled meeting of member of Board of Studies (BoS) of Department of Electronics and Communication Engineering, School of Studies of Engineering and Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur was held to design and discuss the B. Tech. First year (I and II semesters) scheme and syllabi.

The following members were present in the meeting:

1. Prof. Shrish Verma (External Expert Member BoS, Dept. of ECE, NIT Raipur)
2. Mr. Vikas Patel, (External Expert Member BoS, Senior SDE, BSNL Bilaspur)
3. Mrs. Anita Khanna (HOD, Assistant Prof., Dept. of EE-cum Chairman, BOS)
4. Mr. Shrawan K. Patel (Member BoS, Assistant Professor, Dept. of ECE)
5. Dr. Soma Das (Invited Member, Assistant Professor, Dept. of ECE)
6. Mr. Sumit Kumar Gupta (Invited Member, Assistant Professor, Dept. of EE)
7. Mr. Jitendra Bhardwaj (Invited Member, Assistant Professor, Dept. of EE)

Following points were discussed during the meeting

3. New CBCS based evaluation scheme of B. Tech. First year (I and II semesters) was discussed and finalized.
4. Course Basic Electrical and Electronics Engineering (EC201TES01/EC202TES04) of B. Tech. First year (I and II semesters) are discussed and the changes have been incorporated as per the valuable suggestions of Expert member.

विभागाध्यक्ष (इलें. एवं संचार अभियांत्रिकी)
H.O.D. (Elect. & Comm. Engineering)
प्रौद्योगिकी संस्थान
Institute of Technology
गु. घा. वि., बिलासपुर (छ.ग.)
G. G. V. Bilaspur (C.G.)

Signature & Seal of HoD

Scheme and Syllabus

SCHEME OF EXAMINATION
B.TECH (FOUR YEAR) DEGREE COURSE
THIRD YEAR, ELECTRONICS & COMMUNICATION ENGINEERING
SCHOOL OF ENGINEERING & TECHNOLOGY, GGVV BILASPUR (CG) 495009
EFFECTIVE FROM SESSION 2020-21
SEMESTER V (THIRD YEAR)

Sr. No.	Course Code	Course Title	L	T	P	Periods/ week	Evaluation Scheme			Credit
							IA	ESE	Total	
Theory										
1	EC05TPC08	Electromagnetic Waves	3	1	0	4	30	70	100	4
2	EC05TPC09	Computer Network	3	0	0	3	30	70	100	3
3	EC05TPC10	LIC and its Application	3	0	0	3	30	70	100	3
4	EC05TPC11	Control Systems	3	1	0	4	30	70	100	4
5	EC05TPE01 EC05TPE02 EC05TPE03 EC05TPE04	Program Elective – 1 • Information Theory & Coding • CMOS Design • Introduction to MEMS • Computer Architecture	3	0	0	3	30	70	100	3
6	EC05TOE01 EC05TOE02	Open Elective-1 • Data Structure & Algorithms • Operating Systems	3	0	0	3	30	70	100	3
Practical										
1	EC05PPC06	Electromagnetic Waves Lab	0	0	2	2	30	20	50	1
2	EC05PPC07	Computer Networks Lab	0	0	2	2	30	20	50	1
3	EC05PPC08	LIC and its Application Lab	0	0	2	2	30	20	50	1
									Total Credits	23

SEMESTER VI (THIRD YEAR)

Sr. No.	Course Code	Course Title	L	T	P	Periods/ week	Evaluation Scheme			Credit
							IA	ESE	Total	
Theory										
1	EC06TPC12	Digital Signal Processing	3	1	0	4	30	70	100	4
2	EC06TPC13	Probability Theory and Stochastic Processes	3	0	0	3	30	70	100	3
3	EC06TPE05 EC06TPE06 EC06TPE07 EC06TPE08	Program Elective – 2 • Antenna & Wave Propagation • Power Electronics • High Speed Devices & Circuits • Nanoelectronics	3	1	0	4	30	70	100	4
4	EC06TOE03 EC06TOE04	Open Elective-2 • Cryptography & Network Security • Artificial Intelligence	3	0	0	3	30	70	100	3
5	EC06TBS07	Life Science	3	0	0	3	30	70	100	3
Practical										
1	EC06PPC09	Digital Signal Processing Lab	0	0	2	2	30	20	50	1
2	EC06PPC10	Electronic Measurement Lab	0	0	2	2	30	20	50	1
3	EC06PPC11	Mini Project/Electronic Design workshop	0	0	4	4	30	20	50	2
									Total Credits	21

L : LECTURE T: TUTORIAL P: PRACTICALIA: INTERNAL ASSESSMENT ESE: END SEMESTER EXAM

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA(A CENTRAL UNIVERSITY)
CBCS-NEW, STUDY & EVALUATION SCHEME
PROPOSED W.E.F. SESSION 2020-2021
B.Tech. I Year (SEMESTER I)
(Common for CSE, ECE and IT)

SN	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	SUB-TOTAL	
1.	MA201TBS01	MATHEMATICS-I	3	1	-	30	70	100	4
2.	PH201TBS02	PHYSICS	3	1	-	30	70	100	4
3.	EC201TES01	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	3	1	-	30	70	100	4
4.	IT201TES02	INTRODUCTION TO INFORMATION TECHNOLOGIES	2	0	0	30	70	100	2
5.	EN201THS01	ENGLISH COMMUNICATION	3	0	-	30	70	100	3
		Total	**14**	**3**	**0**	**150**	**350**	**500**	**17**
PRACTICALS									
1.	PH201PBS01	PHYSICS LAB	-	-	2	30	20	50	1
2.	ME201PES01	ENGINEERING GRAPHICS	1	-	3	30	20	50	3
3.	ME201PES02	WORKSHOP TECHNOLOGY & PRACTICES	1	-	2	30	20	50	1
4.	EC201PES03	BASIC ELECTRICAL ENGINEERING LAB	-	-	2	30	20	50	1
		Total	**2**	**-**	**9**	**120**	**80**	**200**	**7**
GRAND TOTAL			**16**	**3**	**9**	**270**	**430**	**700**	**24**

Total Credits : **24**
Total Contact Hour : **28**
Total Marks : **700**

*INTERNAL ASSESSMENT- Two Class Test of 15 Marks each will be conducted.
L-LECTURE, T-TUTORIAL, P-PRACTICAL, ESE –END SEMESTER EXAMINATION

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC05TPC08	3	1	0	4 hours	30	70	4

ELECTROMAGNETIC WAVES

Course Objectives:

- To understand the concepts, working principles and laws of Electromagnetic Waves.
- To perform analysis of uniform plane wave and waveguides.
- To understand the basic concept of radiation and antenna.

Unit I: Transmission Lines- Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, reflection coefficient and VSWR, Impedance Transformation on Loss- less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements.

Unit II: Maxwell's Equations- Basics of Vectors, Vector calculus, Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface.

Unit III: Uniform Plane Wave- Uniform plane wave, Propagation of wave, Wave polarization, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor, Plane Waves at a Media Interface- Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary.

Unit IV: Wave propagation in parallel plane waveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide.

Unit V: Radiation: Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna

Text/Reference Books:

1. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India, 2005
2. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India
3. Narayana Rao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall, 1997.
4. David Cheng, Electromagnetics, Prentice Hall

Course Outcomes:

At the end of this course students will demonstrate the ability to:

- Understand characteristics and wave propagation on high frequency transmission lines
- Carryout impedance transformation on TL
- Use sections of transmission line sections for realizing circuit elements
- Characterize uniform plane wave
- Calculate reflection and transmission of waves at media interface
- Analyze wave propagation on metallic waveguides in modal form
- Understand principle of radiation and radiation characteristics of an antenna

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC05TPC09	3	0	0	3 hours	30	70	3

COMPUTER NETWORK

Course Objectives:

Student will try to learn to:

- Build an understanding of the fundamental concepts of computer networking.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
- Develop an understanding of modern network architectures from a design and performance perspective.

Unit I: Introduction to computer networks and the Internet: Application layer: Principles of network applications, The Web and Hyper Text Transfer Protocol, File transfer, Electronic mail, Domain name system, Peer-to-Peer file sharing, Socket programming, Layering concepts.

Unit II: Switching in networks: Classification and requirements of switches, a generic switch, Circuit Switching, Time-division switching, Space-division switching, Crossbar switch and evaluation of blocking probability, 2-stage, 3-stage and n-stage networks, Packet switching, Blocking in packet switches, Three generations of packet switches, switch fabric, Buffering, Multicasting, Statistical.

Unit III: Multiplexing. Transport layer: Connectionless transport - User Datagram Protocol, Connection oriented transport – Transmission Control Protocol, Remote Procedure Call. Transport layer: Connectionless transport - User Datagram Protocol, Connection-oriented transport – Transmission Control Protocol, Remote Procedure Call. Congestion Control and Resource Allocation: Issues in Resource Allocation, Queuing Disciplines, TCP congestion Control, Congestion Avoidance Mechanisms and Quality of Service.

Unit IV: Network layer: Virtual circuit and Datagram networks, Router, Internet Protocol, Routing algorithms, Broadcast and Multicast routing

Unit V: Link layer: ALOHA, Multiple access protocols, IEEE 802 standards, Local Area Networks, addressing, Ethernet, Hubs, Switches.

Text Reference books:

1. William Stallings, "Data and computer communications", Prentice Hall
2. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition
3. J.F. Kurose and K. W. Ross, "Computer Networking – A top down approach featuring the Internet", Pearson Education, 5th Edition
4. L. Peterson and B. Davie, "Computer Networks – A Systems Approach" Elsevier Morgan Kaufmann Publisher, 5th Edition.
5. T. Viswanathan, "Telecommunication Switching System and Networks", Prentice Hall
6. S. Keshav, "An Engineering Approach to Computer Networking" , Pearson Education
7. Andrew Tanenbaum, "Computer networks", Prentice Hall
8. D. Comer, "Computer Networks and Internet/TCP-IP", Prentice Hall

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC05TPC11	3	1	0	4 hours	30	70	4

CONTROL SYSTEMS

Course Objectives:

The students will be able to learn:

- The type of System, dynamics of physical systems, classification of control system, analysis and design objective.
- How to represent system by transfer function and block diagram reduction method and Mason's gain formula.
- Time response analysis and demonstrate their knowledge to frequency response.
- Stability analysis of system using Root locus, bode plot, polar plot, and Nyquist plot.

Unit I: Introduction to control problem- Industrial Control examples. Transfer function. Block diagram and signal flow graph analysis. Open & Closed-loop systems, Control hardware and their models: potentiometers, synchros, LVDT, dc and ac servomotors, tacho-generators, electro hydraulic valves, hydraulic servomotors, electro pneumatic valves, pneumatic actuators.

Unit II: Time response of second-order systems, steady-state errors and error constants. Performance specifications in time-domain, proportional, integral and derivative systems. Feed forward and multi-loop control configurations,

Unit III: Feedback control systems- Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness. stability concept, relative stability, Routh stability criterion. Root locus method of design. Lead and lag compensation.

Unit IV: Frequency-response analysis- Polar plots, Bode plot, stability in frequency domain, Nyquist plots. Nyquist stability criterion. Performance specifications in frequency-domain. Frequency domain methods of design, Compensation & their realization in time & frequency domain. Lead and Lag compensation.

Unit V : State variable Analysis- Concepts of state, state variable, state model, state models for linear continuous time functions, diagonalization of transfer function, solution of state equations, concept controllability & observability. Introduction to Optimal control & Nonlinear control, Optimal Control problem, Regulator problem, Output regulator, tracking problem. Nonlinear system – Basic concept & analysis.

Text/Reference Books:

1. Gopal. M., "Control Systems: Principles and Design", Tata McGraw-Hill, 1997.
2. Kuo, B.C., "Automatic Control System", Prentice Hall, sixth edition, 1993.
3. Ogata, K., "Modern Control Engineering", Prentice Hall, second edition, 1991.
4. Nagrath & Gopal, "Modern Control Engineering", New Age International, New Delhi

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC05TPE01	3	0	0	3 hours	30	70	3

INFORMATION THEORY & CODING

Course Objectives:

- Design the channel performance using Information theory.
- Comprehend various error control code properties.
- Apply linear block codes for error detection and correction.
- Apply convolution codes for performance analysis & cyclic codes for error detection and correction.
- Apply Turbo coding and decoding for error detection and correction.

Unit I: Source Coding: Introduction to Information Theory, Uncertainty and Information, Average Mutual Information and entropy, Information Measures for continuous Random Variables, Source Coding Theorem, Huffman coding.

Unit II: Channel Capacity Coding: Channel Models, Channel Capacity, Channel Coding, Information Capacity Theorem, Shannon Limit, Markov sources.

Unit III: Error Control Coding (Channel Coding) Linear Block Codes for Error Correction & Cyclic Codes: Introduction to Error Correcting Codes, Basic Definitions, Matrix Description of Linear Block Codes, Equivalent Codes, Parity Check Matrix, Decoding of a Linear Block Code, Syndrome Decoding, Hamming Codes. **Cyclic Codes:** Polynomials, The Division algorithm for Polynomials, A Method for Generating Cyclic codes, Matrix Description of cyclic codes, Burst Error Correction.

Unit IV: Convolution Codes: Introduction to Convolution Codes, Tree codes and Trellis Codes, Polynomial Description of Convolution Codes (analytical Representation), distance Notions for Convolution Codes, The Generating Function, Matrix Description of Convolution Codes, Viterbi Decoding, Distance Bounds for Convolution Codes.

Unit V: Turbo Codes: Turbo codes, Turbo decoding, Distance properties of turbo codes, Convergence of turbo codes

Text/Reference Books:

1. Simon Haykin, Digital Communications, Wiley India Edition, 2009
2. N. Abramson, Information and Coding, McGraw Hill, 1963.
3. M. Mansurpur, Introduction to Information Theory, McGraw Hill, 1987.
4. R.B. Ash, Information Theory, Prentice Hall, 1970.
5. Shu Lin and D.J. Costello Jr., Error Control Coding, Prentice Hall, 1983.
6. Todd K. Moon, "Error Correction Coding", 1st Edition, Wiley-Interscience, 2006.
7. F. J. MacWilliams, N. J. A. Sloane, "The Theory of Error-Correcting Codes", North-Holland, Amsterdam, 1977
8. R. E. Blahut, "Algebraic Codes for Data Transmission", 1st Edition, Cambridge University Press 2003.
9. Cary W. Huffman, Vera Pless, "Fundamentals of Error-Correcting Codes", 1st Edition, Cambridge University Press, 2003.
10. Rolf Johannesson and Kamil Sh. Zigangirov, ``Fundamentals of Convolutional Coding'', IEEE Press, 1999.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC05TPE04	3	0	0	3 hours	30	70	3

COMPUTER ARCHITECTURE

Course Objectives:

- To provide an introduction to concepts in computer architecture.
- Impart knowledge on design aspects, system resources such as memory technology and I/O subsystems needed to achieve increase in performance.
- Acquaint the students with current trends in computing architecture.

Unit I: Processor Basics: CPU Organization, Fundamental and features, Data Representation formats, Fixed and Floating point representation, Instruction Sets, Formats, Types and Programming Considerations.

Unit II: Data path Design: Fixed-Point Arithmetic, Combinational ALU and Sequential ALU, Floating point arithmetic and Advanced topics, Hardware Algorithm – Multiplication, Division.

Unit III: Control Design: Basic Concepts, Hardwired control, Microprogrammed Control, CPU control Unit and Multiplier control Unit, Pipeline Control.

Unit IV: Memory Organization: Memory device characteristics, RAM technology and Serial access memories technology, multilevel memory systems, Address translation and Memory allocation systems, Cache memory.

Unit V: System Organization: Programmed I/O, DMA, Interrupts and IO Processors, Processor-level Parallelism, Multiprocessor and Fault tolerance system.

Text /Reference Books:

1. V. Carl Hammacher, "Computer Organisation", Fifth Edition.
2. A.S.Tanenbum, "Structured Computer Organisation", PHI, Third edition
3. Y.Chu, "Computer Organization and Microprogramming", II, Englewood Chiffs, N.J., Prentice Hall Edition
4. M.M.Mano, "Computer System Architecture", Edition
5. C.W.Gear, "Computer Organization and Programming", McGraw Hill, N.V. Edition
6. Hayes J.P, "Computer Architecture and Organization", PHI, Second edition
7. Computer Organizations and Design- P. Pal Chaudhari, Prentice-Hall of India

Course Outcomes:

At the end of these course students will demonstrate the ability to

- Learn how computers work
- Know basic principles of computer's working
- Analyze the performance of computers
- Know how computers are designed and built
- Understand issues affecting modern processors (caches, pipelines etc.).

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC05TOE01	3	0	0	3 hours	30	70	3

DATA STRUCTURE & ALGORITHMS

Course Objectives:

- Learn Basic Data Structures such as, Linked Lists, Stacks and Queues, Tree and Graph.
- Learn Algorithm for Solving Problems Like Sorting, Searching, Insertion and Deletion of Data
- Understand the Complexity of Various Algorithms.
- Introduce Various Techniques for Representation of the Data in in Memory.

Unit I: Algorithm Analysis and Complexity, Data Structure- Definition, Types of Data Structures Recursion: Definition, Linear and Binary Recursion, Searching Techniques, Linear Search, Binary Search.

Unit II: Sorting Techniques: Basic Concepts, Sorting Algorithms: Insertion (Insertion Sort), Selection (Heap Sort), Exchange (Bubble Sort, Quick Sort), Distribution (Radix Sort) and Merging (Merge Sort) Algorithms.

Unit III: Stacks and Queues: Stacks: Basic Stack Operations, Representation of a Stack Using Arrays, Stack Applications: Reversing List, Factorial Calculation, Infix to Postfix Transformation, Evaluating Arithmetic Expressions.

Queues: Basic Queue Operations, Representation of a Queue Using Array, Implementation of Queue Operations Using Stack. Circular Queues, Priority Queues. Applications of Queues- Round Robin Algorithm,

Unit IV: Linked Lists: Introduction, Single Linked List, Representation of a Linked List in Memory, Operations on a Single Linked List, Circular Linked List, Double Linked List, Advantages and Disadvantages of Linked List.

Unit V: Trees: Terms Related to Tree, Binary Tree, Binary Tree Traversals, Creation of Binary Tree from In-order, Pre-order and Post-Order Traversals. Threaded Binary Trees. Binary Search Tree, BST Operations: Insertion, Deletion.

Graphs: Basic Concepts, Representations of Graphs: Using Linked List and Adjacency Matrix, Graph Algorithms. Graph Traversals (BFS & DFS), Applications: Dijkstra's Shortest Path, Minimum Spanning Tree Using Prim's Algorithm, Warshall's Algorithm

Text books:

1. Fundamentals of Data Structures, Illustrated Edition by Ellis Horowitz, SartajSahni, Computer Science Press.
2. G. a. V. Pai, Data Structures and Algorithms-2008, TMH
3. Debasis,Sarnanta- Classic Data Structures- 2/E, PHI,2009

Reference books:

1. E. Horowitz, SartajSahni and Susan anderson, W. H. Freeman -Fundamentals of Data Structures in C
2. Schaum's Series- Introduction of Data Sructure-Prentice Hall of India

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC06TPC12	3	1	0	4 hours	30	70	4

DIGITAL SIGNAL PROCESSING

Course Objectives:

To provide an overview of topics in basic and advanced digital signal processing techniques with applications to speech and image processing.

Unit I: Introduction of discrete time signals, Representation of signals on orthogonal basis, Sampling and reconstruction of signals, Discrete systems attributes, Introduction of Z-Transform, Analysis of LSI systems, Frequency Analysis, Inverse Systems, Discrete Fourier Transform (DFT), Convolution, Correlation, Fast Fourier Transform Algorithm, Decimation –in-Time, Decimation –in-Frequency,

Unit II: Realization of Systems: Realization of digital linear system, Structures for realization of discrete time systems, Structures for IIR and FIR systems, **Realization of IIR filter:** Direct form-I, Direct form-II, Signal flow graph, Cascade form, Parallel structure, Lattice structure, Lattice-Ladder structure. **Realization of FIR filter:** Transversal structure, linear phase realization, Lattice structure.

Unit III: Infinite Impulse Response Filter design (IIR): Features of IIR filters, Design stages, Filter design by Approximation of Derivatives, Impulse invariance method, bilinear transformation method, Butterworth and Chebyshev Design Method, Frequency Transformations in Analog and Digital domain.

Unit-IV: **Finite Impulse Response (FIR) Filter Design:** Linear phase response- Symmetric and Antisymmetric, Design by Window method, Optimal method, Rectangular, Triangular, Hanning, Hamming, Blackman & Kaiser Window, Frequency sampling method, Design of FIR differentiators, Design of Hilbert transformer, Comparison of various design methods.

Unit V: Sampling Theorem and Multi-rate DSP: Introduction, Sampling Rate Conversion by rational factor, Decimation of Sampling rate by an Integer factor, Interpolation of sampling rate by an Integer Factor, Sampling rate alteration or conversion by a rational factor.

Applications of Digital Signal Processing: Introduction, Applications of DSP Digital Sinusoidal Oscillators, Digital Time Control Circuits, Digital Comb Filters. Applications in broader sense: Applications of DSP in Image Processing, Applications of DSP to Radar, Applications of DSP in speech processing.

Text/Reference Books:

1. S. K. Mitra, " Digital Signal Processing: A computer based approach", McGraw Hill, 2011.
2. A.V. Oppenheim and R. W. Schafer, "Discrete Time Signal Processing" , Prentice Hall, 1989.
3. J. G. Proakis and D.G. Manolakis, " Digital Signal Processing: Principles, Algorithms And Applications" , Prentice Hall, 1997.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC06TPC13	3	0	0	3 hours	30	70	3

PROBABILITY THEORY AND STOCHASTIC PROCESSES

Course Objectives:

The main objective of this course is to provide students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science like disease modelling, climate prediction and computer networks etc

Unit I: Introduction to Probability and random variables: Definitions, scope and history; limitation of classical and relative-frequency-base definitions, Sets, fields, sample space and events; axiomatic definition of probability. Combinatorics: Probability on finite sample spaces. Joint and conditional probabilities, independence, total probability; Bayes' rule and applications. The random variable concept, Distribution function, Density function, The Gaussian random variable, other distribution and density examples, Conditional distribution and density functions.

Unit II: Operation on One Random Variable – Expectation & Multiple Random Variables Expectation, Moments, Functions that give Moments, Transformations of a random variable, Computer generation of one random variable. Vector random variables, Joint distribution and its properties, Joint density and its properties, Conditional distribution and density, Statistical independence, Distribution and density of a sum of random variables, Central limit theorem.

Unit III: Random Processes-The random process concept, Stationarity and independence, Correlation functions, Measurement of correlation functions, Gaussian random processes, Poisson random process, Complex random processes

Unit IV: Spectral Characteristics of Random Processes-Power density spectrum and its properties, Relationship between power spectrum and autocorrelation function, Cross-Power density spectrum and its properties, Relationship between cross-power spectrum and cross-correlation function, Some noise definitions and other topics, power spectrum of complex processes.

Unit V: Queueing Theory Introduction markov sequences Queueing Systems, Birth-Death Process The M/M/1 Queueing System The M/M/s Queueing System The M/M/1/K Queueing System The M/M/s/K Queueing System.

Text books:

1. Peyton Z. Peebles"Probability, Random Variables & Random Signal Principles ", TMH, 4th Edition, 2001.
2. Donald Childers, Scott Miller "Probability and Random Processes", ,2Ed,Elsevier,2012

Reference Books:

1. Theory of probability and Stochastic Processes-Pradip Kumar Gosh, UniversityPress
2. Probability and Random Processes with Application to Signal Processing - Henry Stark and John W. Woods, Pearson Education, 3rd Edition.
3. Probability Methods of Signal and System Analysis- George R. Cooper, Clave D. MC Gillem, Oxford, 3rd Edition, 1999.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC06TPE05	3	1	0	4 hours	30	70	4

ANTENNA & WAVE PROPAGATION

Course Objectives:

- To understand the concepts of radiation from loop and wire antenna.
- To understand the basic concept of large gain and broadband antennas.
- To understand the concepts and working principle of currently popular antennas.
- To understand the working of smart antenna and beam forming to fulfill the requirement of latest technologies.

Unit I: Fundamental Concepts- Physical concept of radiation, Radiation pattern, near-and far-field regions, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation, radiation integrals and auxiliary potential functions.

Unit II: Radiation from Wires and Loops- Infinitesimal dipole, finite-length dipole, linear elements near conductors, dipoles for mobile communication, small circular loop.

Unit III: Aperture and Reflector Antennas-Huygens' principle, radiation from rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts, prime-focus parabolic reflector and cassegrain antennas. Broadband Antennas- Log-periodic and Yagi-Uda antennas, frequency independent antennas, broadcast antennas.

Unit IV: Micro strip Antennas- Basic characteristics of micro strip antennas, feeding methods, methods of analysis, design of rectangular and circular patch antennas, Dielectric Resonator Antenna, Antenna Arrays-Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes.

Unit-V: Planar arrays, synthesis of antenna arrays, Basic Concepts of Smart Antennas-Concept and benefits of smart antennas, fixed weight beam forming basics, Adaptive beam forming, Different modes of Radio Wave propagation used in current practice.

Text/Reference Books:

1. J.D. Kraus, "Antennas", McGraw Hill, 1988.
2. C.A. Balanis, "Antenna Theory - Analysis and Design", John Wiley, 1982.
3. R.E. Collin, "Antennas and Radio Wave Propagation", McGraw Hill, 1985.
4. R.C. Johnson and H. Jasik, "Antenna Engineering Handbook", McGraw ill, 1984.
5. I.J. Bahl and P. Bhartia, "Microstrip Antennas", Artech House, 1980.
6. R.K. Shevgaonkar, "Electromagnetic Waves", Tata McGraw Hill, 2005
7. R.E. Crompton, "Adaptive Antennas", John Wiley

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

- Understand the properties and various types of antennas.
- Analyze the properties of different types of antennas and their design.
- Operate antenna design software tools and come up with the design of the antenna of required specifications.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC06TPE06	3	1	0	4 hours	30	70	4

POWER ELECTRONICS

Course Objectives:

- To provide the students a deep insight in to the working of different switching devices with respect to their characteristics.
- To analyse different converters and control with their applications.
- To Learn to Analyse and design controlled rectifier, DC to DC converters, DC to AC inverters,
- To learn to Design SMPS.

Unit I: Characteristics of Semiconductor Power Devices: Thyristor, power MOSFET and IGBT- Treatment should consist of structure, Characteristics, operation, ratings, protections and thermal considerations. Brief introduction to power devices viz. TRIAC, MOS controlled thyristor (MCT), Power Integrated Circuit (PIC) (Smart Power), Triggering/Driver, commutation and snubber circuits for thyristor, power MOSFETs and IGBTs.

Unit II: Controlled Rectifiers: Single phase: Study of semi and full bridge converters for R, RL, RLE and Level loads. Analysis of load voltage and input current- Derivations of load form factor and ripple factor, Effect of source impedance, Input current Fourier series analysis of input current to derive input supply power factor, displacement factor and harmonic factor.

Unit III: Choppers: Quadrant operations of Type A, Type B, Type C, Type D and type E choppers, Control Techniques for choppers – TRC and CLC, Detailed analysis of Type A chopper. Step up chopper. Multiphase Chopper

Unit IV: Single-phase inverters: Principle of operation of full bridge square wave, quasi-square wave, PWM inverters and comparison of their performance. Driver circuits for above inverters and mathematical analysis of output (Fourier series) voltage and harmonic control at output of inverter (Fourier analysis of output voltage). Filters at the output of inverters.

Unit V: Switching Power Supplies: Analysis of fly back, forward converters for SMPS, **Applications:** Power line disturbances, EMI/EMC, power conditioners. Block diagram and configuration of UPS, salient features of UPS, selection of battery and charger ratings, sizing of UPS. Separately excited DC motor drive. P M Stepper motor Drive.

Text /Reference Books:

1. Muhammad H. Rashid, "Power electronics" Prentice Hall of India.
2. Ned Mohan, Robbins, "Power electronics", edition III, John Wiley and sons.
3. P.C. Sen., "Modern Power Electronics", edition II, Chand& Co.
4. V.R. Moorthi, "Power Electronics", Oxford University Press.
5. Cyril W., Lander," Power Electronics", edition III, McGraw Hill.
6. G K Dubey, S R Doradla,:Thyristorised Power Controllers", New Age International Publishers. SCR manual from GE, USA

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	EC201TES01 / EC202TES04	L	T	P	CT-1	CT-II	TOTAL	70	100	04
Subject:	BASIC ELCETRICAL AND ELECTRONICS ENGINEERING	3	1	-	15	15	30			

Basic Electrical and Electronics Engineering

Course Learning Objectives:

- To impart a basic knowledge of electrical quantities such as current, voltage, power, energy and.To provide working knowledge for the analysis of basic DC circuits used in electrical and electronicdevices.
- To provide working knowledge for the analysis of basic AC circuits used in electrical and electronicdevices and measuring instruments
- To explain the working principle, construction, applications of Transformer, DC machines and AC machines.
- To make students understand basics of Diodes and Transistors.
- To impart knowledge about basics of Digital Electronics

Unit-I: DC CIRCUITS (8 hours)

Electrical circuit elements (R, L and C), voltage and current sources, Ohm's Law, Kirchoff's current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin andNorton Theorems. Time-domain analysis of first-order RL and RC circuits. Mesh & nodal analysis, Star- Delta transformation and circuits.

Unit-II: AC CIRCUITS (8 hours)

Representation of sinusoidal waveforms, average and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections. Three-phase power measurement- Two- Wattmeter method. Construction and working principle of single-phase wattmeter and energy meter. Introduction to Sensors and Transducers.

UNIT-III: ELECTRICAL MACHINES (8 hours)

Construction, classification, ideal and practical transformer, equivalent circuit, losses in transformers, tests, voltage regulation and efficiency.
Construction, Working Principle, losses and efficiency of DC Machines and three phase Induction Machine, DC motor.

Unit-IV: SEMICONDUCTOR DEVICES AND APPLICATION (8 hours)

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics.

UNIT V: DIGITAL ELECTRONICS (8 hours)

Binary Number System, Logic Gates,Combinational circuits, Boolean Algebra,De Morgan's Theorem, Half and Full Adders, Flip- Flops. Sequential circuits-Registers and Counters, A/D and D/A Conversion.